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CURRENT SERIAL RECORDS

WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
APR. 1, 1963

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Water Supply Forecasting Unit, Soil Conservation Service, P.O. Box 4170, Portland 8, Oregon.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RIGHTS BR., DEPT. OF LANDS, FORESTS AND NATURAL RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

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WATER SUPPLY OUTLOOK
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for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

ISSUED

APRIL 8, 1963

The Soil Conservation Service coordinates Snow Surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Surveys, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

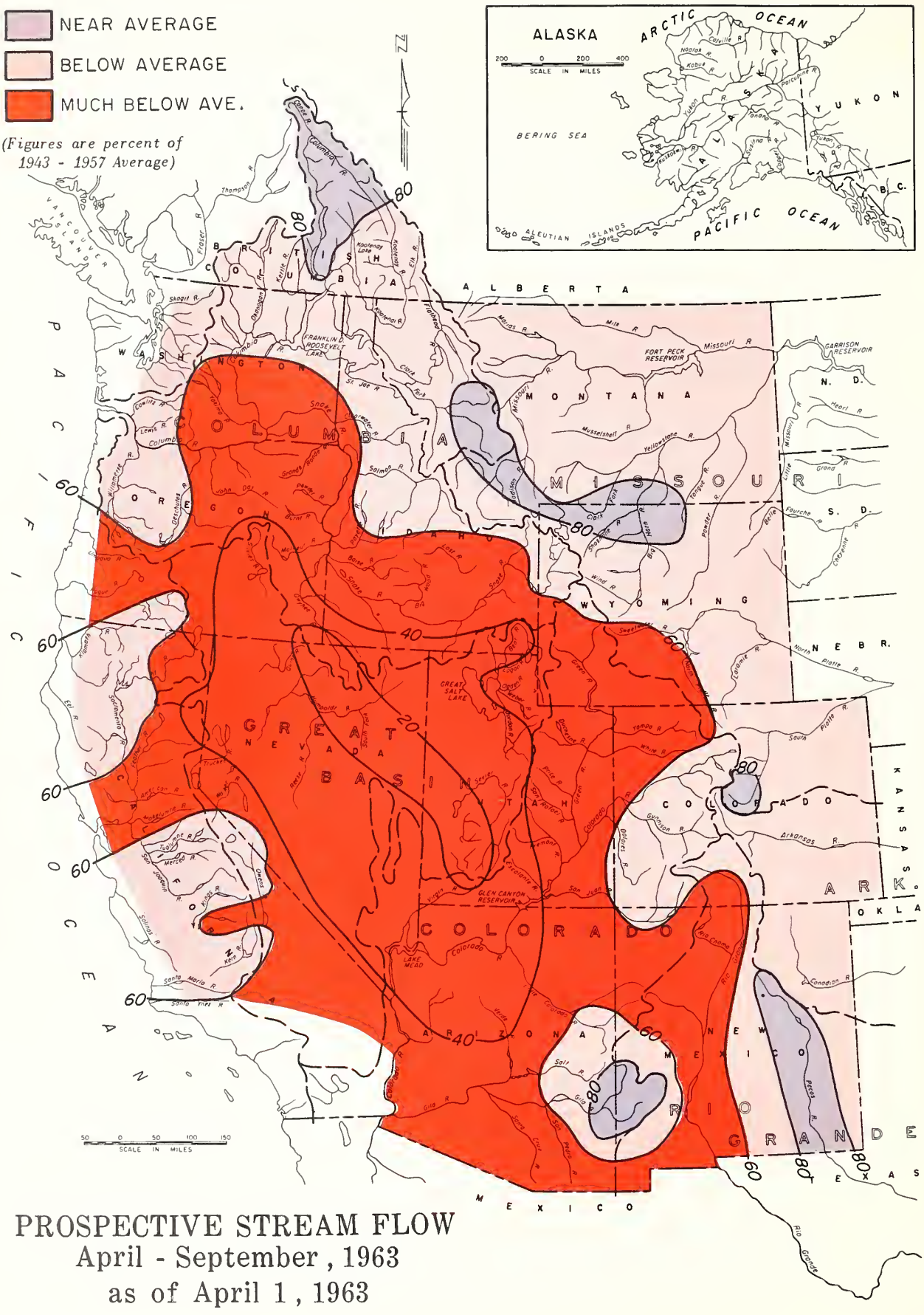
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report is prepared under the direction of R. A. Work, Head, Water Supply Forecasting Unit, Soil Conservation Service, Portland, Oregon, from data and reports supplied by Snow Survey Supervisors of the Soil Conservation Service: Arizona, Richard W. Enz; Colorado and New Mexico, Jack N. Washichek; Idaho, M. W. Nelson; Montana, Phil E. Farnes; Nevada, Manes Barton; Oregon, W. T. Frost; Utah, Gregory L. Pearson; Washington, Robert T. Davis; Wyoming, George W. Peak.

California....Dept. of Water Resources, Robert W. Miller, Chief, Water Supply Forecast and Snow Surveys Unit.

British Columbia.....Dept. of Lands, Forests, and Water Resources, Harry I. Hunter, Meteorologist, Water Rights Branch.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D.A. Williams, Administrator



PROSPECTIVE STREAM FLOW
April - September, 1963
as of April 1, 1963

WATER SUPPLY OUTLOOK

As of April 1, 1963

SNOWMELT SEASON STREAMFLOW WILL BE LESS THAN AVERAGE IN WESTERN UNITED STATES FOR 1963. TOTAL SURFACE SUPPLIES FOR IRRIGATION WILL BE MUCH LESS THAN FOR 1962 BUT GENERALLY IN EXCESS OF 1961. WEST OF THE CONTINENTAL DIVIDE SEVERE SHORTAGES ARE IN PROSPECT FOR MOST OF UTAH, NEVADA, EASTERN OREGON, AND ON TRIBUTARIES TO THE SNAKE RIVER OF IDAHO WHERE STORAGE IS NOT ADEQUATE.

Snow measurements in western mountains as of April 1 show that streamflow during the 1963 irrigation season will be much less than average and less than that which occurred during the same period in 1962. Along the Rocky Mountains from northern Montana to southern Colorado, streamflow forecasts range from 60 to 80 percent of average. Including reservoir storage, water supply outlook is fair, in a few areas good.

For the west coast states and intervening areas to the east in Idaho, Utah, and Nevada, streamflow from snowmelt will be near a minimum of record. Carryover storage from the good water year of 1962, and, in the far west storage from winter streamflow, is the principal factor that allows for a fair water supply outlook this year instead of a widespread shortage. Most streamflow forecasts for the summer months in these six states range from 25 to 50 percent of average--comparable to the drouth year of 1961.

Extreme shortages of irrigation water are now a certainty for all of Utah, the Snake River tributaries in Idaho, along the Humboldt in Nevada, and in the interior basin of southern Oregon. Some streamflow forecasts are the minimum of record. Reservoir storage is far short of average and less than adequate to meet needs.

No large irrigated areas are expected to have a plentiful supply of water, although in many supply will be reasonably adequate. Demands on stored water will be heavy, not only in late season but throughout the summer to supplement deficient streamflow. Water users without storage rights will be most adversely affected.

Mountain snowpack declined more during March in Montana and is now 60 to 80 percent of average. This pattern persists through Wyoming and Colorado. Water supply outlook is generally fair to good in this area including average or above average carryover reservoir storage from 1962. Some smaller streams will have shortages in late season.

For the Pacific Northwest, the flow of the Columbia River is forecast at the lowest total for the April-September period since 1944. Snowpack is near average only in a small area at the extreme northern section of the basin in Canada. March snowfall in the Cascades was average, but the seasonal total snow accumulation remains near the minimum. On the Snake, Clearwater, and Salmon river watershed, March snowfall was negligible. Measured snow water contents actually decreased slightly from March 1 at high elevations where six to ten inches of additional snow water is to be expected. This decline brought the seasonal snowpack in the basin down to less than 50 percent of average for virtually all of the United States portion of the basin except the Clark Fork in Montana. Winter runoff has been generally high. Reservoir storage is near or above average for both power and irrigation uses. Shortages of water are in prospect for Snake River tributaries in Idaho and along the Okanogan in Washington.

Streamflow in the California Central Valley will be seriously short this spring and summer, especially from the central Sierras. February runoff was excessive, which improved reservoir storage. State-wide, it is about 110 percent of average, higher in the San Joaquin Valley. Irrigated lands with access to stored water supplies should experience few problems either in the Central Valley or the Colorado Desert area.

Near average water supplies are in prospect for the Salt River Valley area of Arizona. Reservoir storage is good.

Irrigated areas along the Rio Grande and Arkansas rivers will also have extremely limited water supplies this year. Forecasts for streamflow and reservoir storage are much below average.

With the present outlook, careful planning of water use is essential for 1963, even where the water supply outlook is relatively good. Much depends on adequacy of stored water, which will be depleted by the end of the season. Should the snowpack next winter be deficient, the outlook for 1964 will be poor over a large area of the west.

MISSOURI BASIN

During March there was a general decline in water supply outlook for the Missouri River and its tributaries in Montana, Wyoming, and northeastern Colorado. Average snow remains only on the headwaters of the Gallatin in Montana, with the other areas of the basin ranging near three-quarters of average. In the principal irrigated areas, water supplies can be described as reasonably adequate but with no excess. Most areas will require depletion of stored water to meet requirements during the irrigation season.

MONTANA

Streamflow is forecast at about three-quarters of average for the 1963 snowmelt season. Irrigation water supplies are assured only along the larger streams, the Yellowstone, the Missouri, and the streams that form the main river at Three Forks. Snowpack is light on the Beaverhead tributary to the Jefferson. Late season shortages here are to be expected. Lack of winter snowfall and carryover storage will limit water supplies on the Sun, Marias, and Milk rivers in north central Montana and on Red Rock Creek, tributary to the Yellowstone. Soil moisture in both mountain and valley areas is a favorable segment of the water supply situation.

WYOMING

With a decline in rate of snow accumulation during March, there may be some shortage on the Greybull and other smaller streams in the Powell basin as well as for the Wind and Popo Agie in the Riverton area. This shortage will not be severe but will require careful use of available water supplies. Lack of late winter snowfall has dimmed somewhat the favorable outlook along streams originating in the Bighorn Mountains. With little storage, late flows will not meet needs if late summer rainfall is only average.

With carryover storage at near average levels on the North Platte, irrigation water should be adequate for this season along the North Platte and the Laramie. Inflow forecasts to the reservoir system declined during March to half of average. Storage will be seriously depleted by the end of the irrigation season if summer demands are average.

COLORADO

Water supplies are expected to be reasonably adequate in the South Platte with streamflow on tributaries near the mountains forecast at about three-quarters of average. The general outlook declined during March. Storage in smaller irrigation reservoirs in the upper basin is above average, and those along the lower South Platte are near capacity. With the lack of streamflow, there will be a substantial dependence on the resources of the Colorado-Big Thompson system. Storage in municipal reservoirs is above average.

ARKANSAS BASIN

The outlook for irrigation water supplies along the Arkansas and its tributaries in Colorado and into western Kansas remains poor as of April 1. Streamflow forecasts range from 50 to 70 percent of average. March snowfall was negligible. Storage in John Martin and in smaller irrigation reservoirs is much less than average. Water supply from surface sources will limit crop acreage this year unless spring rainfall is excessive.

Although the flow of the Canadian River in New Mexico will probably be less than average, storage for the Tucumcari Project is above average and comparable to a year ago.

RIO GRANDE BASIN

Streamflow through the San Luis Valley of Colorado will be near a minimum of record for the past 20 years. There was little snow on the high watersheds during March. Extensive use of groundwater will again be necessary. Even if snowfall in northern New Mexico approaches average for April 1, the estimated flow of the Rio Grande at Otowi Bridge is less than 50 percent of average, reflecting the decline in snow cover in the upper basin. Very little inflow is expected into Elephant Butte. Storage for both the middle and lower Rio Grande areas is much below average and comparable to a year ago. Total surface water supply continues to be much less than normal demands.

The outlook for irrigated areas along the Pecos is good. Snow cover on the headwaters is the only area of western United States where snow accumulation to April 1 is above average. Storage in Alamogordo and other reservoirs is relatively high but not at capacity as was the case a year ago.

COLORADO BASIN

The unimpaired flow of the Colorado River near Grand Canyon, Arizona (Inflow to Lake Mead) is forecast at 4,900,000 acre-feet for the April-September 1963 period, or only 54 percent of average and less than one-half of the flow for 1962. Actual inflow will probably be much less depending on storage at Powell, Navajo, and Flaming Gorge reservoirs upstream.

Upper Basin

The seasonal snowpack is less than average over the entire basin. There was little snow accumulation during March, which resulted in a substantial drop in streamflow forecasts for the principal water contributing areas in Wyoming, Colorado, and northwestern New Mexico. Snow water contents in these areas range from 50 to 70 percent of average, with only the Dolores River in southwestern Colorado having a near average snowpack. Even if seasonal streamflow will be much below average, water

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS

APRIL 1, 1963

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	59	62
Madison	48	52
Gallatin	80	82
Missouri Main Stem	66	62
Yellowstone	66	71
Shoshone	82	60
Wind	69	75
North Platte	70	77
South Platte	70	86
ARKANSAS BASIN		
Arkansas	55	74
Canadian	64	80
RIO GRANDE BASIN		
Rio Grande (Colo.)	43	65
Rio Grande above Otowi Bridge	55	71
Pecos	93	127
COLORADO BASIN		
Green (Wyo.)	58	70
Yampa - White	54	70
Duchesne	36	49
Price	47	66
Upper Colorado	44	55
Gunnison	58	73
San Juan	59	72
Dolores	80	97
Virgin	11	17
Gila	13	56
Salt	10	32
GREAT BASIN		
Bear	61	69
Logan	56	64
Ogden	46	56
Weber	58	62
Provo - Utah Lake	51	57
Jordan	37	39
Sevier	41	54
Walker - Carson	53	70
Tahoe - Truckee	33	36
Humboldt	9	12
Lake Co. (Oregon)	16	21
Harney Basin (Oregon)	38	38
UPPER COLUMBIA BASIN		
Columbia (Canada)	92	90
Kootenai	59	55
Clark Fork	73	76
Bitterroot	65	61
Flathead	66	68
Spokane	51	56
Okanogan	58	56
Methow	89	63
Chelan	78	60
Wenatchee	39	34

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	55	60
Snake above Hiese, Idaho	52	56
Snake above American Falls Res	51	55
Henry's Fork	43	49
Southern Idaho Tributaries	44	50
Big and Little Wood	53	61
Boise	54	52
Owyhee	6	9
Payette	63	58
Malheur	29	33
Weiser	35	36
Burnt	15	18
Powder	43	45
Salmon	74	68
Grande Ronde	47	46
Clearwater	51	51
LOWER COLUMBIA BASIN		
Yakima	55	42
Umatilla	35	32
John Day	44	45
Deschutes - Crooked	24	25
Hood	26	22
Willamette	23	22
Lewis	49	43
Cowlitz	62	51
PACIFIC COASTAL BASIN		
Puget Sound	54	39
Olympic Peninsula	51	35
Umpqua - Rogue	29	30
Klamath	26	30
Trinity		
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento		
Feather		
Yuba		
American		
Mokelumne		
Stanislaus		
Tuolumne		
Merced		
San Joaquin		
Kings		
Kaweah		
Tule		
Kern		

For snow cover information refer to Narrative section for California.

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1943-57 period.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER AS OF APRIL 1, 1963

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1962	FORECAST 1963	
UPPER MISSOURI			
Clark Fork at Chance, Montana	662	449	73
Gallatin near Gateway, Montana		422	92
Jefferson at Sappington, Montana		776	72
Madison near Grayling, Montana 1/		302	68
Missouri near Zortman, Montana 2/		3148	65
Missouri near Williston, N. Dakota 3/	13381	8511	68
Yellowstone at Corwin Springs, Montana	2266	1520	77
Yellowstone at Miles City, Montana	7114	4956	74
Shoshone below Buffalo Bill Res., Wyoming 4/		630	74
Wind at Dubois, Wyoming		75	75
PLATTE			
Clear at Golden, Colorado 5/		114	83
North Platte at Saratoga, Wyoming	983	360	54
Cache LaPoudre near Ft. Collins, Colorado 6/	225	146	77
ARKANSAS			
Arkansas at Salida, Colorado 7/	475	230	68
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/		270	55
Rio Grande at Otowi Bridge, New Mexico 9/	771	230	36
Pecos at Pecos, New Mexico *		45	94
UPPER COLORADO			
Animas at Durango, Colorado	492	335	71
Colorado at Glenwood Springs, Colorado 10/		1060	69
Colorado near Cisco, Utah	5201	2700	67
Colorado near Grand Canyon, Arizona 11/	11727	4900	54
Duchesne near Tabiona, Utah 12/	158	70	56
Green near Greendale, Utah 13/		800	54
Green near Green River, Utah 13/	4392	1680	47
Gunnison near Grand Junction, Colorado	1780	950	69
Price near Scofield, Utah 14/		20	50
San Juan near Bluff, Utah 15/		735	60
White at Meeker, Colorado		190	57
Yampa at Steamboat Springs, Colorado	389	210	74
LOWER COLORADO			
Gila at Virden, Arizona (Apr-May)	47	12	88
Salt at Intake, Arizona (Apr-May)	311	70	56
Verde above Horseshoe Dam, Arizona (Apr-May)	58	23	41
GREAT BASIN			
Bear at Harer, Idaho 16/		90	30
Logan near Logan, Utah 17/	140	82	57
Ogden, Inflow to Pine View Res., Utah 18/ (Mar-July)	142	57	40
Provo at Vivian Park, Utah 19/		90	57
Sevier at Hatch, Utah 20/	48	18	37
Sevier near Kingston, Utah	31	4	13
Humboldt at Palisades, Nevada **	267	40	18
Truckee at Farad, California ** 21/	261	75	29
West Walker near Coleville, California **	155	80	54

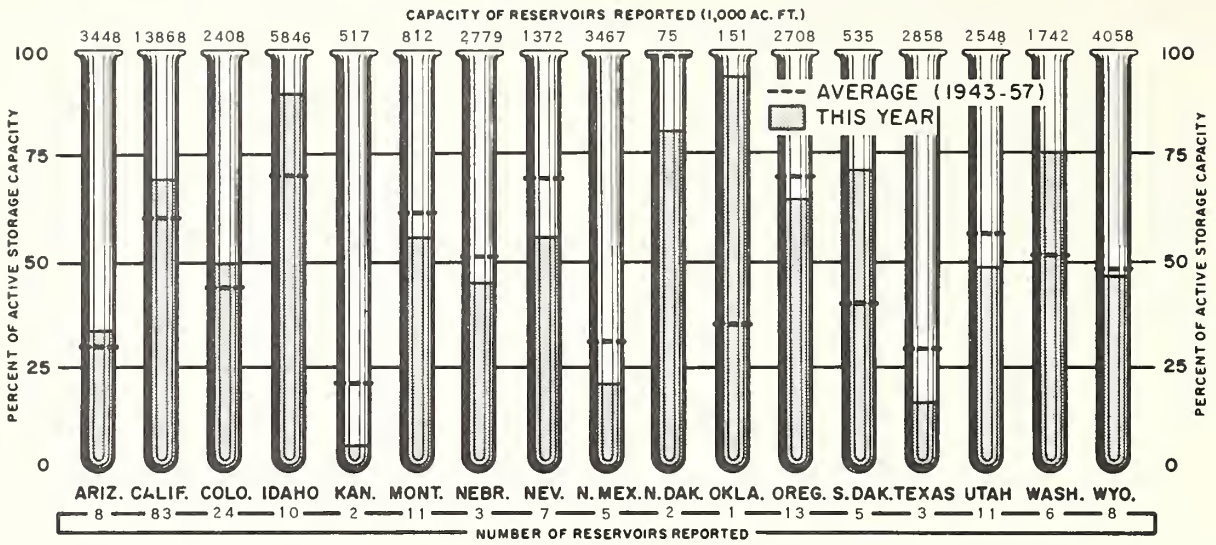
Forecasts in California provided by Department of Water Resources.
Average is for 1943-57 period except California. California is computed for 1908-57 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER AS OF APRIL 1. 1963

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1962	FORECAST 1963	
UPPER COLUMBIA			
Bitterroot near Darby, Montana	548	386	66
Chelan at Chelan, Washington 22/		840	65
Clark Fork above Missoula, Montana	1859	1482	82
Clark Fork at Whitehorse Rapids, Montana 23/	13324	10136	73
Columbia at Revelstoke, British Columbia		18400	99
Columbia at Birchbank, British Columbia 24/	37800	38100	89
Columbia at Grand Coulee, Washington 24/	62300	56200	83
Columbia at The Dalles, Oregon 24/	92700	78560	74
Flathead near Polson, Montana 23/	7073	5711	76
Kootenai at Wardner, British Columbia	4150	3270	71
Kootenai at Leonia, Idaho	7605	6280	70
Okanogan near Tonasket, Washington		1150	60
Spokane at Post Falls, Idaho 25/	3050	1800	56
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/		100	58
Big Wood, Inflow to Magic Res., Idaho 27/ (Mar-July)		120	39
Boise above Diversion Dam, Idaho 28/	1483	850	50
Clearwater at Spalding, Idaho	8370	5800	64
Malheur near Drewsey, Oregon	62	24	30
Owyhee Res. Net Inflow, Oregon 18/	340	65	15
Payette near Horseshoe Bend, Idaho 29/	1652	980	49
Salmon at Whitebird, Idaho	6180	4700	66
Snake near Heise, Idaho 30/	4260	2500	60
Snake at Weiser, Idaho	5190	3800	49
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington		2010	70
Deschutes at Benham Falls, Oregon 31/		360	60
Grande Ronde near LaGrande, Oregon	148	90	45
Hood near Hood River, Oregon 32/	357	205	56
Willamette at Salem, Oregon 33/	5984	3272	60
Yakima near Parker, Washington 34/		710	36
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington			
Rogue at Raygold near Central Point, Oregon	792	525	52
Klamath Lake, Net Inflow, Oregon 35/	447	375	59
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.	1272	800	58
Feather near Oroville, Calif.	1825	1130	57
Kaweah near Three Rivers, Calif. 37/	310	266	58
Kern near Bakersfield, Calif.	515	310	69
Kings, Inflow to Pine Flat Res., Calif.	1485	800	67
Merced, Inflow to Exchequer Res., Calif.	662	390	62
Mokelumne, Inflow to Pardee Res., Calif.	508	300	62
Sacramento, Inflow to Shasta Res., Calif.	1506	1400	77
San Joaquin, Inflow to Friant Res., Calif.	1486	960	78
Stanislaus, Inflow to Melones Res., Calif.	779	480	65
Tule, Inflow to Success Res., Calif.	49	18	31
Tuolumne, Inflow to Don Pedro Res., Calif.	1317	850	70
Yuba at Smartville, Calif.	1142	600	53

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period*

RESERVOIR STORAGE as of April 1, 1963



supplies will be adequate along the main tributaries, such as the Yampa, White, Upper Colorado, Gunnison, Uncompahgre, Animas, and San Juan rivers. Late season shortages will be common for the small irrigated areas along the side tributaries unless summer rainfall is high.

The water supply outlook for Colorado River tributaries in Utah is very poor. All forecasts are for less than 50 percent of average flow, which are comparable to or less than those for the drouth years of 1960 and 1961. Reservoir storage, which alleviates the shortages in many other areas of the west, is limited in this area. The flow last year was not sufficient to meet the immediate demands and restore reservoirs to normal operating levels.

On the Virgin River in southwestern Utah, there will be practically no runoff from snowmelt and therefore very little water for irrigation purposes. Forecasts are below any flows previously experienced. Storage is of little consequence in this area. At this late date there is practically no probability of any improvement in water supply outlook conditions.

ARIZONA

The water supply outlook is near average. Runoff is expected to be much below average for the spring months on most streams, but storage is good in the major reservoirs. Water levels in reservoirs serving central Arizona have dropped from a month ago to meet heavy demands in excess of present streamflow. On Salt and Little Colorado tributaries, storage is low and has little chance of improving for this year.

Streamflow forecasts for April-May flow vary from 41 percent of average on the Verde to 88 percent of average for the Upper Gila. Generally, water supplies should be adequate in major irrigated areas, but continued pumping will be required in central Arizona.

GREAT BASIN

UTAH

March storms failed to bring any major improvement in the water supply outlook for most of the state. The water supply outlook for all streams in the Great Basin area of Utah is poor. The best prospects are on the Cottonwood Creeks near Salt Lake, the Upper Provo, Weber, and Logan rivers. Forecasts for these streams range from 55 to 65 percent of average. The outlook for water for lands served by Utah Lake and for the southern tributaries is very poor. Storage in Utah Lake is comparable to 1961, and the tributary flow will probably not exceed that of two years ago. Other streams in northern Utah are forecast at less than one-half of average.

Some streams in southwestern Utah will establish new record low streamflow this summer. Among these are the Beaver near Beaver, Coal Creek at Cedar City, and Sevier at Hatch.

NEVADA

Irrigation water supplies will be extremely short this year. Water users depending on natural streamflow will have a negligible water supply. Smaller streams throughout the state will peak early and recede rapidly. On the other hand, water users on east slope of Sierra streams which have storage rights will have a reasonably adequate water supply. With flow from winter rains, reservoir storage is in good shape except for Lake Tahoe on the Truckee and Rye Patch on the Humboldt. Because of the heavy demand to augment streamflow, all reservoirs will probably be as depleted as they were at the close of the 1961 season.

STORAGE IN LARGE RESERVOIRS

APRIL 1. 1963

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	333
Buffalo Bill	380	152
Canyon Ferry	2043	1962
Hebgen	385	272
Tiber	1316	661
Belle Fourche	185	175
Keyhole	190	67
Fort Peck	19410	10070
Fort Randall	6100	3894
Garrison	24500	12798
Oahe	23600	10942
PLATTE		
Glendo	786	398
Pathfinder	1011	504
Seminoe	982	332
Colo-Big Thompson (4)	865	586
City of Denver (4)	218	174
ARKANSAS		
Conchas	600	200
John Martin	367	21
RIO GRANDE		
Elephant Butte	2207	394
El Vado	194	5
UPPER COLORADO		
Flaming Gorge	3789	109
Navajo	1709	150
Powell	28040	312
LOWER COLORADO		
Havusu	619	554
Mead	27207	21864
Mohave	1810	1703
San Carlos	1206	121
Salt River Res. (4)	1755	1018
Verde River Res. (2)	322	31
GREAT BASIN		
Bear	1421	977
Lahontan	286	262
Rye Patch	179	84
Sevier Bridge	236	70
Strawberry	270	55
Tahoe	732	263
Utah	1149	317

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	326
Coeur d'Alene	238	177
Flathead	1791	759
Hungry Horse	3428	2842
Kootenay	817	173
Pend Oreille	1561	1085
Roosevelt	5232	2803
LOWER COLUMBIA		
Detroit	300	372
Hills Creek	356	311
Lookout Point	337	338
Yakima Res. (5)	1065	973
SNAKE		
American Falls	1700	1679
Arrowrock	287	277
Anderson Ranch	423	315
Brownlee	1427	1183
Cascade	653	604
Jackson	847	599
Lucky Peak	278	203
Palisades	1202	1074
Owyhee	715	363
PACIFIC COASTAL		
Clear Lake (Ore.)	440	137
Upper Klamath	584	530
Ross	1203	1149
Trinity	2500	2451
CALIFORNIA CENTRAL VALLEY		
Almanor	650	474
Berryessa	1600	1500
Cachuma	206	185
Casitas	248	52
Cherry Valley	268	143
Don Pedro	260	219
Folsom	1010	638
Hetch-Hetchy	360	143
Isabella	552	183
McClure	281	213
Millerton	503	451
Nacimiento	350	248
Pardee	210	183
Pine Flat	1001	523
Shasta	4500	3838

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

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Snowfall near the end of March and the first few days of April was not sufficient to materially change the water supply outlook. Soil moisture conditions in the western section of the state are good.

OREGON

Snowpack in south central Oregon is extremely light but up slightly from March 1 as a result of storms ending about April 1. Snowpack ranges from about 10 to 40 percent of average. Reservoir storage is limited. Severe shortages will occur in this section of Oregon.

COLUMBIA BASIN

Mountain snowpack continues to be much below normal over the Columbia Basin, with some increase in respect to average in the Cascades and a decline along the Continental Divide and in central Idaho. Many snow courses in the United States section have water equivalents near the minimum of record. The flow of the Columbia at The Dalles for the April-September 1963 period is forecast at 78,500,000 acre-feet or 74 percent of average.

BRITISH COLUMBIA

The Water Resources Service of British Columbia reports that a very light snowpack continues at lower elevations although snowpack has increased materially in recent weeks along the Columbia-Frazer Divide. Snow accumulation continues to be near average in the Big Bend area in the northern section of the Basin.

The flow of the Kootenay is forecast near 70 percent of average along the full length of the river. The main stem of the Columbia River is forecast at near average at Revelstoke and 89 percent of average at Birchbank.

Irrigated areas along the Similkameen and Okanogan rivers can expect some water shortages this irrigation season.

MONTANA

Forecasts for the flow of the Flathead and Clark Fork rivers declined slightly during March to about three-quarters of average. Forecasts for the Kootenai and Bitterroot remained well below average at 65 to 70 percent. Power reservoirs are expected to fill. Irrigation water supplies, while much less than average, will be adequate except for probable late season shortages along the Bitterroot.

IDAHO

Snowfall during the 1963 season has been one of the lightest ever recorded in Idaho. Fall and winter precipitation has also been below normal, leaving soil moisture beneath the snowpack dry. Streamflow forecasts for the major rivers range from 50 to 60 percent of average.

Valley soils in the irrigated areas are also dry at this time, and irrigation water has been turned on in order to provide seedbeds with enough moisture to germinate the crops planted.

Reservoir stored water on the main stem of the Snake, Boise, Payette, and Wood rivers is excellent and can make up for most of the deficiency in streamflow expected for 1963. However, practically all of the smaller rivers and streams, without adequate storage facilities, are forecast to have critically short water supplies this season.

Water supply outlook for 1963 appears similar to the dry years of the middle thirties, and water should be conserved wherever possible for carryover into the 1964 season.

OREGON

Water supply outlook is very poor for 1963 for lands served from direct streamflow. In contrast, most lands having access to storage will have sufficient water for near normal operations. March storms brought heavy snow to the Cascades and the highest elevation areas of eastern Oregon but failed to make up the huge deficit in the record low snowpack. Most reservoirs will be completely drained this year, leaving no reserve supply for 1964. Storage in 24 major irrigation reservoirs is 94 percent of average.

Seasonal snow accumulation state-wide is the lowest since 1934. Soil in both mountain areas and irrigated valleys is unusually wet, except for the top few inches at lower elevations.

WASHINGTON

Forecasts for streamflow in Washington are much below average, including that of the Columbia River through the state. Snow cover increased materially in the Cascades during March, but is far short of that necessary to overcome the deficiency in snowpack during the early and mid-winter months.

With reservoirs on the Yakima at near capacity and an improved, if much below average, outlook for streamflow, the water supply outlook for this large irrigated area is good. The flow of the Okanogan and its tributaries will be less than average, and water shortage is in prospect for those areas. Conconully and Salmon reservoirs have a record low storage for this date.

Winter precipitation has been near average. Such as has occurred has been in the form of rain rather than snow. In common with other west coast states, winter streamflow has been high. Streamflow was declining rapidly to below average as of April 1.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys in California reports the water conditions in

California as of April 1 show a general improvement over the situation reported one month ago. March weather was quite beneficial to the state as a whole. The major water producing areas north of the Tehachapi received above average precipitation during March--predominately cold type storms deposited snow at the higher elevations and lowered the effective snowline--and the cool weather and overcast skies during the storm period prevented depletion of the deficient (but very important) snowpack which had accumulated. The March storms also had such additional fringe benefits as delaying the beginning of the summer forest fire season, and they were a great help to California agriculture in general, and the rangeland in particular.

Although the March weather pattern helped the water condition situation a great deal, the fact still remains that the spring and summer flows will be significantly below average in major streams. Again shortages may be expected to occur in areas dependent on the natural flow of streams not having adequate storage.

March was the turning point as far as this season's water conditions are concerned. Conditions now might generally be classed as fair to adequate--whereas a dry March could have committed the state as a whole to a generally poor supply. As of the writing of this report, the first few days of April certainly indicate that if conditions change significantly, the change will be towards improvement.

Snowpack water content ranged from a low of 20 percent of average in the Surprise Valley area to a high of 100 percent of average on the Owens River watershed. Snowpack for the state as a whole was a low 35 percent of normal on April 1. This made it one of the worst snow years on record. However, the season up to March 15 had the lowest snowpack on record, and this includes records that go back to 1878.

Reservoirs in California gained over two million acre-feet of storage during March and had 108 percent of their 10-year average content on April 1. Interstate reservoirs, additional to the above, received a slight decrease in storage, but remained at 126 percent of average. Generally, the amount of storage gained in the Pacific drainage basins has been related directly to the March precipitation pattern over the state. The Colorado desert and South Coastal areas, receiving less than average precipitation experienced a slight reduction in storage during the month. All other areas received near or above normal precipitation and all but the Lahontan area reported gains in reservoir storage. Sacramento Valley reservoirs contain 105 percent of their average, and in the San Joaquin Valley storage raised to 143 percent of the past 10-year April 1 average.

South of the Tehachapi it still is another dry year. Seasonal precipitation and streamflow are much below normal. San Diego, for instance, is undergoing the second driest year in a 113-year record. Fortunately, the sources of imported supplies, Lake Mead and Owens Valley, are in relatively good condition this year.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes Tunnels and Ewing, Fremont, Wurtz and Columbine Ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge Reservoir. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow adjusted for change in storage in Bear Lake Reservoir. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow adjusted for change in storage in Otter Creek Reservoir.

21/ Observed flow adjusted for change in storage in Boca Reservoir but not Lake Tahoe. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse Reservoir. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay Lake, Hungry Horse, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, and Brownlee; and pumping to Banks Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie Canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch and Arrowrock Reservoir. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood Reservoir. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elm, Bumping and Tieton reservoirs, plus diversions by Rosa, New Reservation, Old Reservation, and Sunnyside Canals. 35/ Flow records provided by COPCO and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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